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TEACHING OF STATISTICS.

DISCUSSION OF PROFESSOR BAILEY'S PAPER.

BY GROVER G. HUEBNER.

Perhaps more than any other subject, statistics as taught in the universities must be closely moulded according to the needs and demands of the student. A line may be drawn, it seems, between a course such as is desired by the student who wishes to become a trained statistician and by him who is being prepared to enter the financial, commercial, or industrial world as a business man. The former wishes to make a business of statistics: the latter wishes to know merely enough about statistics to aid him in his banking, mercantile, insurance, manufacturing or other business or to enable him to better understand the affairs of everyday life.

Of the former kind of student there are, as a rule, but relatively few. There are, occasionally, a few graduate students who desire to enter the government service or who, as investigators, wish instruction in statistics. But there are very few undergraduates in the average university who attend with the idea of entering the government or other service as statisticians. The instructor, with a class of such students, would outline a highly technical course requiring a large amount of work on their part, and, intending ultimately to become statisticians, they would find it interesting and be willing to devote a good share of their time to it.

But such a course would be beyond the average student who, as the son of a broker, banker, insurance man, manufacturer, merchant, or other business man, intends to enter his father's business. To him statistics are but a means of expression. They confront him in many of his affairs, both public and private, and he wishes to know how to interpret them. Much of the highly technical instruction desired by the former class of students must necessarily be omitted or they will get little out of the course. It seems also that it would be wise to open such a class to second-year men, so that they can make use of their training throughout the remaining two and principal years of their college course. No matter what line of study he may be specializing in, a careful study of statistics enables him to better understand the lectures given him by his instructor and the special reports which he is so often required to prepare. The application of a course in statistics to sociology and kindred subjects is generally recognized in colleges, but it may

equally well be applied to many other subjects taught in the large universities of to-day. The study of trade and trade organization involves a constant use of statistics; insurance has its mortality statistics; banking has its bank statements; transportation has its tonnage and mileage statistics; accounting constantly deals with figures. Even an elementary training in the use of figures would be of material aid to the student who is about to specialize in any one of these subjects; and, since he does his specializing in the last two years, it seems advisable that he be permitted to receive some statistical training as a Sophomore.

Various ends may be accomplished in a statistical course such as this, which would be of value to any student willing to do a reasonable amount of earnest work. In the first place the instructor may render an invaluable service merely by driving home to them the spirit of accuracy,—the spirit that statistics are not to be accepted without an understanding of what they actually represent. How were they collected? Exactly what items are included and what items are excluded in a given table or chart? They should see that only in that way can they know whether an apparent tendency shown in a statistical table is real or is merely the result of a change in statistical method.

Frequently the importance of this can be impressed upon them by glaring mistakes made in papers which they are preparing. Unintentional and vital errors may also be pointed out to them on the part of authors who accepted grand totals without examining the separate items. In commercial statistics, for instance, though the government records make clear specifications, writers have confused copper ingots with telegraph wires, tanned leather with boots and shoes, rough lumber with mahogany chairs. Just such errors have been made in nearly every other branch of statistical study. If the instructor succeeds in doing nothing else than instilling this spirit of accuracy, he will be rendering the student an invaluable service.

The second aim would be to acquaint the student with the main statistical tools, such as the mode, the median, the use of averages, the tabulation of statistics so as to present a clear picture, the reduction of highly irregular data to a readable form, the drawing of accurate and readable statistical curves. To the statistician the making of a table is a matter of course; but how many untrained men are there who can tabulate their results into a readable form? One is often confronted by merely a column of figures, and the average reader judiciously avoids them.

A third end is to acquaint the student with the principal statistical sources in some of the main fields of investigation. The meaning of the terms used and the purposes for which the data may or may not be used must be explained to him. This may be done in the case of the sources

of labor statistics, social and vital statistics, commerce, transportation, industry, insurance, and others. If the student is particularly interested in any subject of general interest, it will of course be included, otherwise it may be taken up with him privately.

Lastly, as Professor Bailey has explained, each student should be required to prepare a number of papers. These may be adjusted as much as possible to the chosen field of each individual student. If properly done, he will get more out of this part of his work than out of any number of lectures, no matter how carefully prepared. It is in his class report that he attempts to apply whatever he has heard in the classroom. By preparing his papers under the immediate guidance of the instructor, a student who is not afraid of work may carry away with him something of material aid. It was once my good fortune to attend a university course in statistics under the guidance of a very able statistician, a member of your association, and I have never regretted the hours which I then spent with him.

A college course in statistics, however, may not be regarded as a guarantee of efficiency. Even the kind of instruction sought by the few students who wish to become statisticians or investigators is only a starter. The success of the individual student will depend upon how well he can apply that instruction. Some of them can never become experts. The more general course, moreover, does not seek to produce expert statisticians. It seeks to enable the layman, whether in public life or private business, to better understand the results obtained by the statisticians. To the average layman a table of statistics is like a juggler's wand, the result depending wholly upon the skill and desire of the particular juggler. Even an elementary course in statistics dispels much of this erroneous darkness and mystery, and thereby renders a lasting service both to the layman and to the unbiassed statistician.